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west virginia department of environmental protection

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Office of Oil and Gas  
601 57th Street SE  
Charleston, WV 25304  
(304) 926-0450  
(304) 926-0452 fax

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
[www.dep.wv.gov](http://www.dep.wv.gov)

## PERMIT MODIFICATION APPROVAL

November 05, 2013

PDC MOUNTAINEER LLC  
POST OFFICE BOX 26  
BRIDGEPORT, WV 26330

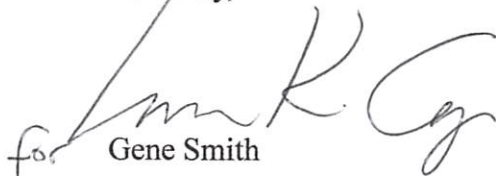
Re: Permit Modification Approval for API Number 3305741 , Well #: MAXWELL 3HM  
**Changed bottom hole**

**Oil and Gas Operator:**

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

Please call James Martin at 304-926-0499, extension 1654 if you have any questions.

Sincerely,



for Gene Smith  
Regulatory/Compliance Manager  
Office of Oil and Gas

**STATE OF WEST VIRGINIA**  
**DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS**  
**W.VA. CODE §22-6A - WELL WORK PERMIT APPLICATION**

1) Well Operator: PDC Mountaineer LLC 494494839 Harrison Union Mount Clare 7.5'  
Operator ID County District Quadrangle

2) Operator's Well Number: 3 HM Well Pad Name: Maxwell

3 Elevation, current ground: 1462' Elevation, proposed post-construction: 1459'

4) Well Type: (a) Gas ☒ Oil ☐  
Other ☐  
(b) If Gas: Shallow ☒ Deep ☐  
Horizontal ☒

5) Existing Pad? Yes or No: No

6) Proposed Target Formation(s), Depth(s), Anticipated Thicknesses and Associated Pressure(s):

Marcellus Shale, 7600' TVD, Approximately 100 feet thick, 7600' x 0.594 psi/ft = 4514 psi calculated reservoir pressure.

SDW  
9/5/13

7) Proposed Total Vertical Depth: 7600'

8) Formation at Total Vertical Depth: Marcellus Shale

9) Proposed Total Measured Depth: 13,700'

10) Approximate Fresh Water Strata Depths: 302', 369', 396', & 429'

11) Method to Determine Fresh Water Depth: Reported wells: 47-033-04775, 04559, 04575, & 05556

12) Approximate Saltwater Depths: 628', 1261'

13) Approximate Coal Seam Depths: 361', 540'

14) Approximate Depth to Possible Void (coal mine, karst, other): Not Known.

15) Does land contain coal seams tributary or adjacent to, active mine? No

16) Describe proposed well work: Drill & stimulate a new horizontal Marcellus well following all State & Federal guidelines.

All casing used in the wellbore will be new casing. Centralizers will be used contingent upon final log of well. Production string cement will be at least 100 feet into the intermediate string. Cement will be API grade.

17) Describe fracturing/stimulating methods in detail:

Slick water frac, pumping 80 bbls minimum. Each stage to contain approximately 10,000 bbl of water and 40,000 pounds of sand.  
Frac additives, chemical names, and CAS #'s are provided on the next page.

18) Total area to be disturbed, including roads, stockpile area, pits, etc, (acres): \_\_\_\_\_

19) Area to be disturbed for well pad only, less access road (acres): \_\_\_\_\_

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WV Dept. of Environmental Protection

20)

**CASING AND TUBING PROGRAM**

| <b>TYPE</b>  | <b>Size</b> | <b>New<br/>or<br/>Used</b> | <b>Grade</b> | <b>Weight per<br/>ft.</b> | <b>FOOTAGE:<br/>For Drilling</b> | <b>INTERVALS:<br/>Left in Well</b> | <b>CEMENT:<br/>Fill -up (Cu. Ft.)</b> |
|--------------|-------------|----------------------------|--------------|---------------------------|----------------------------------|------------------------------------|---------------------------------------|
| Conductor    | 20"         | New                        | H-40         | 94#                       | 65'                              | 65'                                | Cement to Surface                     |
| Fresh Water  | 13 3/8"     | New                        | J-55         | 54.5#                     | 500'                             | 500'                               | Cement to Surface                     |
| Coal         |             |                            |              |                           |                                  |                                    |                                       |
| Intermediate | 9 5/8"      | New                        | J-55         | 40#                       | 2850'                            | 2850'                              | Cement to Surface                     |
| Production   | 5 1/2"      | New                        | P-110        | 20#                       | 13,700'                          | 13,700'                            | 2791 minimum                          |
| Tubing       |             |                            |              |                           |                                  |                                    |                                       |
| Liners       |             |                            |              |                           |                                  |                                    |                                       |

| <b>TYPE</b>  | <b>Size</b> | <b>Wellbore<br/>Diameter</b> | <b>Wall<br/>Thickness</b> | <b>Burst<br/>Pressure</b> | <b>Cement<br/>Type</b> | <b>Cement Yield</b> |
|--------------|-------------|------------------------------|---------------------------|---------------------------|------------------------|---------------------|
| Conductor    | 20"         | 24"                          | 0.756                     | 1500                      | 1                      | 1.06                |
| Fresh Water  | 13 3/8"     | 17 1/2"                      | 0.66                      | 1730                      | 1                      | 1.18                |
| Coal         |             |                              |                           |                           |                        |                     |
| Intermediate | 9 5/8"      | 12 1/4"                      | 0.704                     | 3520                      | 1                      | 1.18                |
| Production   | 5 1/2"      | 8.5"/8.75"                   | 0.722                     | 12,460                    | H                      | 1.18                |
| Tubing       |             |                              |                           |                           |                        |                     |
| Liners       |             |                              |                           |                           |                        |                     |

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**PACKERS**

|             |  |  |  |  |
|-------------|--|--|--|--|
| Kind:       |  |  |  |  |
| Sizes:      |  |  |  |  |
| Depths Set: |  |  |  |  |

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SEP - 6 2013

Office of Oil and Gas  
WV Dept. of Environmental Protection

**MAXWELL LEASE  
WELL NO.'S 1HM - 6HM**

MAXWELL  
WELL NO.'S  
1HM-6HM

ASSOCIATED  
PIT

SEE MAXWELL SITE PLAN FOR  
COMPLETE DETAILS OF ACCESS  
ROAD, PIT, AND PAD DESIGNS.



Professional Energy Consultants  
A DIVISION OF SMITH LAND SURVEYING

SURVEYORS  
PROJECT MGMT.

**SLS**

ENGINEERS  
ENVIRONMENTAL

226 West Main St.  
P.O. Box 150  
Glenville, WV 26031  
(800) 462-5834

56655 Diller Bottom Road  
Shakeridge, OH 43047  
(740) 671-9911

HONESTY, INTEGRITY, QUALITY

TOPO SECTION OF USGS  
MOUNT CLARE 7.5' QUADRANGLE

**SCALE: 1"=500'**



|                    |                  |                  |                           |
|--------------------|------------------|------------------|---------------------------|
| DRAWN BY<br>C.P.M. | FILE NO.<br>7995 | DATE<br>03-28-13 | CADD FILE:<br>7995REC.DWG |
|--------------------|------------------|------------------|---------------------------|

## 3HM WELL TIES

| LINE | BEARING       | DISTANCE |
|------|---------------|----------|
| L1   | N 02°08'46" W | 4232.05' |
| L2   | N 14°45'23" E | 2524.34' |
| L3   | N 20°00'00" W | 5290.00' |
| L4   | S 64°40'28" W | 331.53'  |

MAXWELL LEASE  
WELL NO. 3HMWV L03140.001-004  
132 ACRE  
LEASE TRACTWELL NO. 3HM  
TOP HOLE  
STATE PLANE COORDINATES  
(NORTH ZONE NAD '27)N. 265,036  
E. 1,754,372TOP HOLE (NAD 27)  
LAT=(N) 39°13'27.9"  
LONG=(W) 80°22'01.3"TOP HOLE (NAD 83)  
LAT=(N) 39°13'28.3"  
LONG=(W) 80°22'00.6"TOP HOLE UTM (NAD 83)  
(N) 4,341,883  
(E) 554,653WELL NO. 3HM  
LANDING POINT  
STATE PLANE COORDINATES  
(NORTH ZONE NAD '27)N. 265,236  
E. 1,753,210LANDING POINT (NAD 27)  
LAT=(N) 39°13'29.8"  
LONG=(W) 80°22'16.1"LANDING POINT (NAD 83)  
LAT=(N) 39°13'30.1"  
LONG=(W) 80°22'15.4"LANDING POINT UTM (NAD 83)  
(N) 4,341,938  
(E) 554,298WELL NO. 3HM  
BOTTOM HOLE  
STATE PLANE COORDINATES  
(NORTH ZONE NAD '27)N. 270,207  
E. 1,751,400BOTTOM HOLE (NAD 27)  
LAT=(N) 39°14'18.8"  
LONG=(W) 80°22'39.7"BOTTOM HOLE (NAD 83)  
LAT=(N) 39°14'19.1"  
LONG=(W) 80°22'39.0"BOTTOM HOLE UTM (NAD 83)  
(N) 4,343,443  
(E) 553,722

## REFERENCES

## NOTES ON SURVEY

1. TIES TO WELLS, REFERENCES, AND CORNERS ARE BASED ON GRID NORTH FOR THE WV STATE PLANE COORDINATE SYSTEM NORTH ZONE NAD '27.
2. LEASE BOUNDARY SHOWN HEREON TAKEN FROM DEED BOOK 142 PAGE 484 AND ADJOINING DEEDS.
3. SURFACE OWNER AND ADJOINER INFORMATION TAKEN FROM THE ASSESSOR AND COUNTY CLERK RECORDS OF HARRISON COUNTY IN JULY, 2012.
4. WELL LAT./LONG. (NAD'27) ESTABLISHED BY DGPS(SURVEY GRADE).

(+ ) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS.

DATE APRIL 3, 20 13

REVISED DATE SEPTEMBER 3, 20 13

OPERATORS WELL NO. MAXWELL 3HM

API WELL NO. 47 - 33 - MOD 05741 H6A  
STATE COUNTY PERMITSTATE OF WEST VIRGINIA  
DIVISION OF ENVIRONMENTAL PROTECTION  
OFFICE OF OIL AND GAS

I THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE REGULATIONS ISSUED AND PRESCRIBED BY THE DIVISION OF ENVIRONMENTAL PROTECTION.

P.S.  
677

Gregory A. Smith



MINIMUM DEGREE OF ACCURACY 1 / 200 FILE NO. 7995P3HMR3(448-13)  
PROVEN SOURCE OF ELEVATION DGPS (SUBMETER MAPPING GRADE) SCALE 1" = 2,000'

WELL TYPE: OIL GAS ☒ LIQUID INJECTION WASTE DISPOSAL IF "GAS" PRODUCTION ☒ STORAGE DEEP SHALLOW ☒  
LOCATION: ELEVATION 1,462' WATERSHED WEST FORK RIVER  
DISTRICT UNION COUNTY HARRISON QUADRANGLE MOUNT CLARE 7.5'  
SURFACE OWNER LYNCH FARM, LLC ACREAGE 37.5±  
ROYALTY OWNER WBM PROPERTIES LLC, ET AL ACREAGE 748, 42, 44.21, 73.75, 97.5, & 132±  
PROPOSED WORK: LEASE NO. \_\_\_\_\_  
DRILL ☒ CONVERT \_\_\_\_\_ DRILL DEEPER \_\_\_\_\_ REDRILL \_\_\_\_\_ FRACTURE OR STIMULATE ☒ PLUG OFF OLD  
FORMATION \_\_\_\_\_ PERFORATE NEW FORMATION \_\_\_\_\_ PLUG AND ABANDON \_\_\_\_\_ CLEAN OUT AND REPLUG \_\_\_\_\_ OTHER \_\_\_\_\_  
PHYSICAL CHANGE IN WELL (SPECIFY) \_\_\_\_\_ TARGET FORMATION MARCELLUS  
ESTIMATED DEPTH 7,590' TVD / TMD 13,695'

WELL OPERATOR PDC MOUNTAINEER, LLC  
ADDRESS 120 GENESIS BOULEVARD  
BRIDGEPORT, WV 26330

DESIGNATED AGENT JAMIE HAGA

ADDRESS 120 GENESIS BOULEVARD  
BRIDGEPORT, WV 26330

COUNTY NAME

PERMIT